Notes.

A pleasant surprise was experienced by those who attended the meeting of the Wireless Section of the Institution of Electrical Engineers on November 24 in meeting Dr. Alexander Graham Bell, the veteran inventor of the telephone, who had been on a visit to England and to his old home in Scotland, but is now on the way to his adopted home in the United States. Dr. Bell, who stated that his connection with telephone matters had ceased some thirty years ago, expressed his pleasure at meeting that section of the electrical world which represented the future perhaps more than any other, and referred to the remarkable developments that were being made in wireless telephony, in which the telephone had gone far beyond his most sanguine conceptions of its possibilities. The *Times* reports an interesting account given at a later interview by Dr. Bell of his researches which led up to the invention of the telephone forty-five years ago. Dr. Bell had long been interested in the mechanism of speech, and in reading of the researches of Helmholtz on the nature of vowel sounds, in a language with which he was unfamiliar, he had at first wrongly concluded that Helmholtz had transmitted such sounds by electrical means. Although he soon discovered his mistake, the idea that a transmission of this kind should be possible remained in his mind, and came to fruition later when he combined two separate lines of research which he had been prosecuting on multiple telegraphy by currents of different frequencies and on recording sound-waves for the benefit of the deaf, and thus arrived at the production and application of an undulating current representing the sound-waves of speech. The freedom of his native city of Edinburgh was conferred upon Dr. Bell on Tuesday, November 30.

Prof. W. H. Eccles, chairman of the Wireless Section of the Institution of Electrical Engineers, in his inaugural address at the meeting referred to above, gave a masterly review of the progress of research during and since the war on the thermionic-valve tube, which originated out of the Fleming oscillation valve, and had become, in its three-electrode or "triode" form, the basis of all modern wireless telegraphy. He reviewed some of the interesting papers which had already described the intensive development of the subject under the stimulus of war, but not the least interesting part of his address was his account of some of his own extensive researches in the investigation of the interdependence of the currents and voltages in the various circuits connected to the grid, anode, and filament of the tube, with a view to greater certainty in the design of such tubes to fill the conditions required with a maximum of efficiency. Owing to the number of variables involved, he had extended his treatment from the ordinary plotting of curves in two dimensions to the manufacture of a series of clay models of surfaces in three dimensions, which should be of very great value in elucidating the properties of these tubes. Other scientific questions raised by phenomena met with in wireless telegraphy which Prof. Eccles dealt with included the diurnal variations in the ionisation of the upper layers of the atmosphere, which he suggested might possibly account for certain remarkable discrepancies in the results of wireless direction-finding apparatus at particular times in the day by causing a rotation of the plane of polarisation of the received waves.

At the opening meeting of the Röntgen Society, held on November 18 at University College, it was announced that the first award of the Mackenzie Davidson medal had been made to Dr. F. W. Aston. The award, which was instituted to perpetuate the memory of the late Sir J. Mackenzie Davidson, is made by the council of the society for the most noteworthy contribution to its meetings during the session on some subject bearing upon radiology. Dr. Aston's paper was read on June 1, and appears in the current issue of the Journal of the society under the title "Positive Rays." It deals with the remarkable series of isotopes among non-radio-active substances, which Dr. Aston has been investigating for several years.

The twenty-sixth annual congress of the Royal Institute of Public Health, which will be of an international character, will be held next year in Geneva, on the invitation of the University, from Tuesday, May 10, to Monday, May 16, inclusive. Further particulars can be obtained from the Secretary, 37 Russell Square, W.C.1.

The British Silk Research Association has been approved by the Department of Scientific and Industrial Research as complying with the conditions laid down in the Government scheme for the encouragement of industrial research. The secretary of this association is Mr. A. B. Ball, Silk Association of Great Britain and Ireland, Inc., Kingsway House, Kingsway, W.C.2.

The Government of the Czecho-Slovak Republic has established, under the Ministry of Education, a Weather Bureau in Prague, to do for that country the work formerly done at the meteorological central stations of Vienna and Budapest. The new bureau will extend the meteorological service formerly conducted in connection with the K. k. Sternwarte, Prag-Klementinum (Astronomical Observatory). The director, Dr. Rudolf Schneider, is anxious to receive for the library of the bureau all the reports of observations and meteorological publications formerly sent to the Sternwarte, and he will be glad to send to other meteorological stations and offices publications of his bureau in exchange.

For some time past the National Union of Scientific Workers, the Institute of Chemistry, and the British Association of Chemists have had under consideration the matter of income-tax assessment of scientific workers. After several discussions it was agreed unanimously to prepare a memorial to the Lords of the Treasury setting out under six distinct headings a claim for abatements. The memorial was forwarded to scientific societies and to research and technical staffs of various institutions and science faculties of the universities of the United Kingdom, many of which associated themselves with the memorial. It was then sent to the proper authorities. The secretary of the joint committee has now been informed that the Chancellor of the Exchequer has arranged for the Commissioners of Inland Revenue to meet a deputation of scientific workers on Friday, December 10, to afford them the opportunity of supporting their claims.

THAT excellent institution the Children's Museum of Brooklyn has sent us an issue of its *News*, which is devoted to an account of the museum's efforts to Americanise the children drawn to New York from all the countries of Europe. The museum, it is claimed, can supply that which the teacher cannot provide, namely, an American background for the intellectual life of the child. This is effected by helping the pupils to visualise incidents in the lives of past Americans through the numerous models and objects of historic interest in the museum. By contact with these concrete exhibits the abstract knowledge provided in school becomes more real to them, and a personal link with the country's past is forged in the mind of each child. The influence of the museum is even wider than mere Americanisation, for "the person whose intellect is overtrained to the neglect of the senses is perhaps a greater menace to the community than the illiterate."

THE fourth annual Report of the National Research Council of the United States of America consists of 68 pages, and shows that a large proportion of the programme of the Council is now in operation. The funds are provided mainly by the Carnegie Corporation of New York, the Rockefeller Foundation, the General Education Board, and the Commonwealth Fund. Its purpose is to promote research in the mathematical, physical, and biological sciences with the object of increasing knowledge and contributing to the public welfare. One of its thirteen divisions deals with foreign relations, and represents the Council at the meetings of the International Research Council. Another deals with the physical sciences, and already has research committees on atomic structure, celestial mechanics, X-ray spectra, electrodynamics, photo-electricity, etc. The engineering division has committees on fatigue in metals, heat treatment of steel, pyrometers, highways, etc. The chemistry division has committees on synthetic drugs, colloids, ceramics, etc. The Council is to be congratulated on the speed with which it has got to work.

WE have received a copy of the appeal issued by the University of Birmingham for 500,000*l.* The present financial position, as set forth in the circular, is indeed critical. The increase in cost of administration and maintenance, coinciding with an increased demand on the capacity of the University—each additional student costs about three times as much as he contributes—has made bankruptcy the only alternative to a large addition to its resources. Among the objects of the appeal the first place is rightly given to the improvement of the salaries of the teaching staff, especially of the non-professorial section. Provision has also to be made for the enlargement of existing departments to cope with the demands made upon them. It is further pointed out that additional chairs are required in many subjects (*e.g.* mathematics, physics, chemistry, engineering, and biology) and that increased facilities for research are urgently needed. There is, moreover, an insistent and growing demand on the part of industrial workers for extra-mural work, and classes have been created for trade unionists, in which special instruction is given in English literature, economics, and modern history, in co-operation with the Workers' Educational Association. The provision of hostels for men students is also very desirable. Finally, it is urged that grants or gifts to the University will in all probability secure an equivalent from the Government. A first list of contributions shows promises amounting to more than 250,000*l.*, of which nearly one-half is given by representatives of the petroleum mining industry for a petroleum mining endowment fund. We sincerely hope that further lists may show that the Birmingham and Midland district is alive to its responsibilities in the matter and that the desired sum may be raised.

IN the Museum Journal of the University of Pennsylvania (vol. xi., No. 1, March, 1920) a valuable article, with excellent illustrations, is published describing a collection of "fetish" figures from equatorial Africa. The word "fetish" is now suspect among anthropologists, as its meaning has been unreasonably extended. At the same time, the great majority of these wood carvings have undoubtedly some connection with the religious magic of the negro, and among the special group of the Bakuba-Baluba peoples in the South-Western Congo region the best and least contaminated negro art is found among a race which possesses a more highly developed system of cults, religions, or magico-religions than any other Congo people possessing such a high degree of culture.

THE *Archives of Radiology and Electrotherapy* for October (No. 243) contains the continuation of a sketch of the history of electrotherapy by Mr. H. A. Colwell. The period dealt with is from 1800 to 1879, and the apparatus of various inventors is described and figured, such as Golding-Bird's contact-breaker (1838), Neef and Wagner's and Benedict's induction coils, Piscii's magneto-electric shocking machine (1832), and various portable batteries. Contact-breakers worked by an assistant were in use as late as 1849. The account, which is a very interesting one, is to be continued.

Medical Science: Abstracts and Reviews for November (vol. iii., No. 2) contains a critical review of the cancer problem, particularly of work done during the last twenty years. In England and Wales one woman in eight and one man in eleven above the age of thirty-five years dies of cancer. Acquired immunity to transplanted cancer in the mouse and rat can be produced by means of *living* cancer-cells. Altmann's granules are absent from the cells of malignant growths. The blood and tissues of cancerous persons contain more potassium than normal, and human cancerous material contains more radium than normal. Considerable space is devoted to the various methods of treatment of cancer, which it is concluded must proceed along the lines of a judicious combination of surgery and irradiation.

IN the Museum Journal of the University of Pennsylvania (vol. x., No. 4, December, 1919) we have an account of head-hunting among the Jivaro tribe, occupying a large territory on the eastern slope of the Andes in the Republic of Ecuador. They have been called cannibals, but they never eat any part of the human body. The mummified heads of their enemies are the most esteemed war trophy, because the head must be present at the victory feast which the hero is expected to give. The head must be preserved, because it requires many months to clear a field and grow yucca and bananas to provide food for the numbers attending the feast. The head is fixed on a staff and paraded, with a tribute to the valour of the slayer, before the assembled tribesmen. After this an orgy of eating and drinking continues for days until all the supplies are exhausted.

THE way in which one part of an organism regulates the activity of another is a problem of supreme interest in biology. In unicellular organisms the transmission is local, but in multicellular organisms conduction may be by the circulating fluid or by nerves. Conduction by nerves is the main theme discussed by Prof. R. S. Lillie in an address on "The Nature of Protoplasmic and Nervous Transmission" (*Journ. Physical Chemistry*, vol. xxiv., 1920, p. 165). The propagated disturbance in nerves cannot be a chemical transport because of its rapidity. A nerve-impulse is always accompanied by an electrical change of potential of sufficient voltage to stimulate another nerve. The hypothesis is advanced that the current of action stimulates a contiguous portion of nerve, thus accounting for the transmission of the impulse. The negative electrical potential at an active part of the nerve is short-circuited through the surrounding electrolyte solution, so that the current passes in at the active portion of the nerve and out at an inactive part. The inactive portion of nerve is thus stimulated as if by the cathode of an external stimulating circuit. The time required for the potential to reach its maximum is 0·001 of a second, and, assuming that the current is effective over a length of 3 cm., the rate of conduction would be 30 metres per second; this is the value obtained for a frog's nerve at temperatures of about 15° C. The propagation of the nerve-impulse is compared to "passive" iron and its activation, the two processes having much in common.

THE newly established French Office Scientifique et Technique des Pêches maritimes is issuing a series of Notes et Mémoires, and No. 2, "Le Merlu," by Dr. Ed. le Danois, has just been published. It is a summary of our knowledge of the life-history of the hake. Of late years this has become one of the most important of marine food-fishes because of its wide distribution. Compared with our knowledge of other fishes, very little is known as yet of the general biology of the hake, and it has been proposed (by the International Council for the Exploration of the Sea) to institute investigations (to be carried out by France, England, and Ireland) on this and other fishes inhabiting the south-western European area. The paper under notice is therefore opportune. It is almost entirely a *résumé* of the research which has been carried out on the hake by the various fishery authorities, and it is accompanied by a series of sketch-charts representing the seasonal distribution of the fish, the localities of fishing, the spawning places and periods, and the migrations. A summary of the European commercial hake fisheries is also given. The author discusses the causes of migration, and suggests a factor which seems to be new (though this is difficult to say, for no references to published work are given). Food is not a factor, for that taken by the hake is variable, and during its spawning periods (when its migrations are most noticeable) it does not eat at all. Its migrations cannot be correlated with any seasonal changes in the plankton. On the other hand, changes of temperature throughout the year either enlarge or restrict its range of distribution, and variations of salinity are also factors. The body of the young hake is relatively dense, but as the genital organs mature the density diminishes. This leads to a greater energy requirement in relation to the locomotion of the fish, and it seeks water of lower salinity or higher temperature, or both. Thus, by reason of "the principle of least effort," the hake migrates into shallower, warmer, and less saline waters as its breeding season approaches.

A CHADWICK public lecture was delivered by Prof. J. B. Farmer in the lecture hall of the Medical Society of London on November 5, the subject being "Some Biological Aspects of Disease." The lecturer pointed out that it was now a recognised fact that co-ordinated growth in an organism leading to the development of a particular form depended on the serial or sequential nature of the reactions which went on in its cells and tissues. Recognition of this was essential to a proper appreciation of the larger problems of health and disease. By the consideration of examples, taken chiefly from the plant-world, it was shown how differences in chemical or physical environments produced definite changes in the organism, though close analysis of the facts emphasised the essential point that it is only when environment was able to interfere, as it were, with the protoplasm itself that response of this kind was obtained. The effects of the temporary isolation of parts of the body from the material influences exerted by adjacent parts might result in a permanent loosening of the ties which previously had knit the constituent cells into a coherent organism, while the union of parts hitherto separate sometimes led to the formation of a synthetic new organism; lichens are striking examples of this. The consequences of the mutual relations established between parasite and host were dealt with, particularly with reference to the abnormal growths which can be traced to substances injected by parasitic animals. Prof. Farmer then passed on to discuss briefly the abnormal growths or neoplasms which originate as the result of obscure changes taking place within the cells themselves. The essential features of malignant growths were described and the outline of a plan of research for the advancement of our knowledge of the causes of cancer was suggested.

THE proceedings of the sixth annual Indian Science Congress, which was held in Bombay on January 13–18, 1919, have been published in the Journal and Proceedings of the Asiatic Society of Bengal, vol. xv., No. 4. The volume contains full reports of the presidential address delivered by Sir Leonard Rogers, an abridged version of which appeared in NATURE of May 29, 1919, and of the presidential addresses delivered to the various sections. The latter are followed by brief abstracts of the other papers read at the meeting.

A GAZETTEER of streams of Texas has been compiled by the United States Geological Survey and published as Water Supply Paper No. 448. Source, length, and topographical details are given in all cases, while in that of the more important streams other information, such as season of greatest flow, gradient, and precipitation in the basin, is added. The work is based on the best maps available, supplemented by personal reconnaissance. References are given to sheets of the topographic survey. The addition of a map to the volume would have rendered it more useful for reference.

WE learn from the *Geographical Journal* for November that Col. P. H. Fawcett is planning to return to his work of exploration in Western Brazil east of the Bolivian frontier. The expedition, which has the active support of the Brazilian Government, will include, besides Col. Fawcett, two Brazilian officers and Major Lewis Brown, of the Australian infantry. The investigation of the Indian tribes is one of the chief objects of the expedition. Cartographical work will be governed by astronomical observations and based for its longitudes upon the courses of the main rivers as determined by the work of the Rondon Commission.

THE potentiality of Australia for white settlers is discussed by Dr. Griffith Taylor in an article entitled "Nature *versus* the Australian" in *Science and Industry* for August. After a discussion of the amount and variability of rainfall in Australia, Dr. Taylor divides the country into seven regions based on rainfall, in terms of which agricultural and pastoral production can be classified. Farming and close white settlement generally are, and, he contends, will be, confined to three of these regions, which embrace the Riverina, Victoria, Tasmania, eastern Queensland, the north-east of New South Wales, and "Swanland" in Western Australia. The distribution of minerals, especially coal, will in time result in dense population irrespective of agricultural potentiality, but in Australia the coalfields occur in the regions favoured by climate, and so tend to more centralisation of population. Dr. Taylor is not hopeful of white settlement in tropical Australia, and gives adequate climatic reasons for his opinions. The paper concludes with a tentative map showing the habitability of the globe. In the southern hemisphere south-eastern Australia and New Zealand alone are indicated as areas with a potentiality in white settlement of more than 125 per square mile.

THE Department of Agriculture of the Union of South Africa has recently issued a report (Bulletin No. 4, 1920) on investigations in the wool industries of Great Britain and the United States of America with a view to the betterment of the industry in South Africa. An interesting survey is made of the kinds and qualities of wool and its substitutes, and a useful comparative statement gives the countries to which South African wool was exported from 1913 to 1919. Next to Great Britain, Germany was the largest purchaser of South African wool previous to the war, and since then her place has been taken by America and Japan. Very informative tables are appended showing the world's wool production and the estimated world's wool stocks in the 1919–20 season. While the usual annual supply of the world is estimated at 2,700,000,000 lb., there was available in 1919–20 for consumption by manufacturing countries as much as 4,200,000,000 lb. The defects of South African wool are gone into in detail, and useful suggestions are made with a view to their elimination. Great care appears to have been taken in estimating the capital expenditure required to build and equip factories for specialisation in the various branches of manufacture of woollens and worsteds, the expected output from certain machines is properly tabulated, and the cost of labour is shown for England, France, the United States, Germany, and Austria, while the cost of running and maintenance of plant is dealt with systematically.

UNTIL recently the process of the melting and casting of metal in a brass mill was very similar to that practised 240 years ago. As a rule, small crucibles having a maximum holding capacity of about 300 lb. were used. The advent of the electric furnace, however, is now rapidly revolutionising the industry. In one type the heat of the electric arc is used, and in the other—the induction type—the metal is melted by the electric currents induced in it. An interesting account of the latter kind of furnace is given by Mr. G. H. Clamer in the Journal of the Franklin Institute for October. Official tests show that about 10 lb. of two-to-one yellow brass are brought to the casting temperature (2000° F.) per electric unit expended in the Ajax-Wyatt furnace. The metal is melted directly by the Joule effect, the electromagnetic forces keeping it circulating. A very interesting induction furnace has been invented by Dr. Northrup. Instead of using alternating current of the ordinary commercial frequencies, he uses currents having frequencies of 10,000, similar to those sometimes used in long-distance radio-telegraphy. In this case no resistance column of molten metal is necessary. The metal contained in a plain cylindrical crucible is brought to any required temperature by the induced eddy currents. These furnaces are suitable for very high temperature melting, such as is required, for instance, by alloy steels and precious metals.

Under the comprehensive title of "Sterilisation of Water by Chlorine Gas" a paper by Capt. J. Stanley Arthur was read before the Institution of Mechanical Engineers on November 19. The part of the paper dealing with the general aspect of the subject adds little or nothing to our knowledge, and contains statements which, to say the least, are still debatable. For example, the author states that water treated with chlorine gas is less liable to an objectionable taste than when treated with bleaching-powder, and, further, that any taste so imparted can readily be removed by the addition of sulphur dioxide. Other experimenters have found that there is little or no difference between bleaching-powder and chlorine gas as regards taste, and also that some tastes produced by chlorination are absolutely unaffected by the further addition of sulphur dioxide. Also, no mention is made of the pioneer work on chlorination of Houston and McGowan at Lincoln in 1905 or of any of Houston's later work on the subject. The greater part of the paper consists of the detailed description of an American device for accurately administering the dose of chlorine and its adaptation for the purpose of sterilising the water-supply to the troops during the war. These descriptions are very clearly stated and well illustrated with careful drawings. No other types of chlorinators are described, although there are others equally efficient now on the market. The paper concludes with a warm tribute to Sir William Horrocks for his work on water purification for the Army, and is further evidence of the great part played by the sanitary section of the R.A.M.C. in winning the war; it is probable, however, that Sir William and his colleagues would be the first to acknowledge their indebtedness to others not mentioned in Capt. Arthur's paper.

The latest catalogue (No. 407) of second-hand books offered for sale by Mr. F. Edwards, 83 High Street, Marylebone, W.1, is devoted to botany, ranging over the subjects of agriculture, gardens, orchids, trees, fruits, fungi, lilies, and roses. It should be of interest to many readers of Nature. Many choice and rare works are listed, among them several herbals, a complete set of the *Annals of Botany, Curtis' Botanical Magazine*, 1787–1915, and Sir J. D. Hooker's "Botany of the Antarctic," 6 vols.

We are informed that the office of the Assistant Commissioner of Forestry for England and Wales (Mr. Hugh Murray) is now situated at 30 Belgrave Square, London, S.W.1. The headquarters of the Commission remains at 22 Grosvenor Gardens, London, S.W.1.

Our Astronomical Column.

The Leonid Meteoric Shower.—Mr. Denning writes that on November 15 and 16 the Leonids returned in moderate numbers. Mr. C. P. Adamson, observing at Wimborne, Dorset, watched the sky during a period of ten hours, and saw thirty-three Leonids out of a total of ninety-eight meteors recorded. The radiant point was placed at 150°+22°, and the display furnished objects of the usual swift and streak-leaving character.

Miss A. Grace Cook, at Stowmarket, also witnessed the return of the meteors on the same nights and determined the radiant in precisely the same position as Mr. Adamson. Mr. A. King made observations from Lincolnshire, and on November 15, during a watch of three hours between 11h. 18m. and 14h. 37m., saw thirty meteors, of which nine were Leonids directed from a radiant at 152°+23°. Other showers were seen from 63°+22° (five meteors), 107°+35° (seven meteors), and 116°+49° (five meteors) at the middle of November.

The reappearance of the Leonids adds another link to the chain of past observations, which prove that this stream of meteors is visibly continuous throughout the entire orbit, and that it may be viewed every mid-November when the prevailing atmospheric conditions are favourable.

Radiation Pressure on Electrons and Atoms.—Mr. Leigh Page discusses this subject in *Astrophys. Journ.* for September. It was formerly concluded that radiation pressure reached a maximum for particles of diameters comparable with a wave-length, and fell off rapidly for smaller particles. The present paper shows that this result neglects resonance, and that the radiation pressure on an atom "depends on the intensity of that portion of the incident radiation which has a frequency equal to the natural frequency of the oscillator." It is deduced that the pressure of solar radiation is greatest on an atom which has a resonant frequency in the infra-red near to wave-length 9000 Å., being within one-third of this maximum value for the range 4000 Å. to 28,000 Å. The pressure may be further increased if the atom has more than one resonant frequency.

It is shown that in certain circumstances the repulsive force may be thirty times that due to gravitation. It thus seems sufficient to explain most of the phenomena of comets' tails, and removes the difficulty formerly felt, namely, that the spectroscope shows the presence of certain gases in the tail, for the molecules of which the pressure was thought to be negligible. The author states that since writing the paper he has found that some of his conclusions were published by M. Gouy in 1913 (*Comptes rendus*, vol. clvii., p. 186).

Perturbations in a Stellar Orbit.—There are not many cases where perturbations in stellar orbits can be observed with any degree of accuracy. Mr. J. S. Paraskevopoulos examines the case of 13 Ceti in *Astrophys. Journ.* for September. This is a visual binary with a period of 6·88 years, while the brighter star is a spectroscopic binary with a period of 2·0818 days. The eccentricity of the orbit of the visual pair is 0·725. The author has remeasured a number of spectrograms taken at the Yerkes Observatory between 1906 and 1913, deducing separate orbits at three different epochs. These show that the period is shorter by 1/200 day at apastron of the visual companion than at periastron, this being analogous to the period of the moon at aphelion and perihelion. Motion of the line of apsides is well established. It is concluded that the mass of the visual companion does not fall far short of, and may exceed, that of the spectroscopic pair. Taking the parallax as 0·050″ (J. A. Miller), m/M becomes 1·32.

The system 85 Pegasi is referred to, in which Prof. G. Van Biesbroeck deduced that the mass of the brighter component was only 0·36 of that of the whole system.